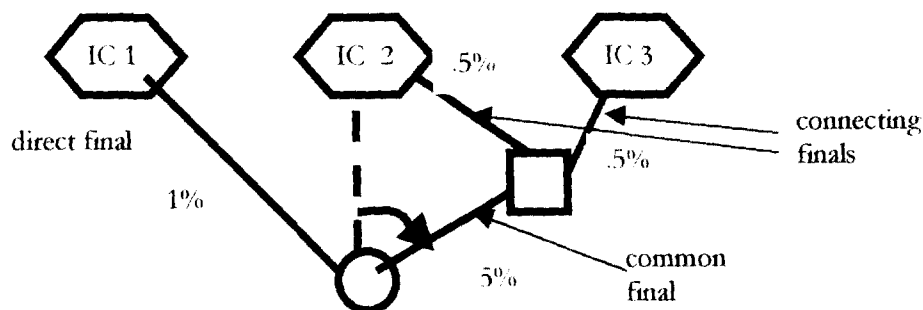


Customer QOS depends in a complex way on the position and capacity of each of the trunk groups in that sequence. That is, some customer demands will have only one path and others may have four or more in going from a source A to a destination B. Generally, as in the above figure on the left, the longer the distance from A to B and/or the sparser the demands, the more (**shared**) paths may be available. (In fact, there may be no direct path.) However, a single, direct trunk group (from A to B), as in the figure on the right, may provide the best service (customer QOS) and most "efficient" operation, **but only where economically justified**.

Because of these considerations and tradeoffs, such networks have, for about 50 years, been engineered to meet **network-related QOS** objectives that balance notions of cost, efficiency and service quality. The high-usage groups, which offer overflow to "final groups" or other high-usage groups, are engineered to economic, rather than QOS objectives. That is, the number of trunks in a high-usage group depends on the relative costs and efficiencies of the high-usage group as compared to the next alternate route (usually a final). In some cases (e.g., a parallel, protective high-usage group, or PPHU), a high-usage group is installed simply to ensure service quality for first-routed traffic that would otherwise have only one indirect path, a shared (common) final. Then, acceptable network service is assured by engineering the final (a trunk group that does not overflow to other groups) to an average "blocking" objective. (This is appropriate since traffic blocked on this final may not be completed over alternate facilities without network management intervention.) The most commonly accepted engineering objectives, implemented in the associated measurements and tools, provide for an **average blocking** of either .5% or 1% on "**final**" trunk groups.

In the case of an "equal access" (Feature Group D) arrangement for IXC and CLEC traffic being routed through a LEC tandem, the "common" and "connecting" final trunk groups are engineered to an average blocking of .5% so that the total network QOS of 1% average blocking is roughly comparable to any direct trunking arrangement with an objective of 1% average blocking.



It is worth emphasizing two points here. First, this early example of QOS parity, implemented around 1984 for IXC access via an RBOC common final (in a Feature Group D arrangement), did not demand **customer QOS parity**; rather it defined a notion of **network QOS parity**. Specifically, this leads to the second point: customers may, in fact,

have quite different *customer-QOS*, even under "equal access" performance definitions. Some points relevant to this IXC-access example:

- The customers *on the common final*, engineered to an *aggregate* average blocking of .5%, may see average blocking ranging from, say, .1 to .8% depending on their demand characteristics and the traffic mix *on that group*.
- Therefore, customers with *no high-usage option* may experience customer average access blocking (from end office to IXC) of .6 to 1%.
- Some customers will have first-choice routes utilizing high-usage groups that *overflow to the common (equal-access) final* only as a second choice route. These customers may experience *customer average access blocking* (from end office to the IXC) of less than 1% (often) or more than 1% (sometimes) depending on how the high-usage group is sized and the traffic mix on the common final.

With this brief background, it should be clear why the industry agreed in 1984 to focus on network QOS objectives (as defined for the final groups only) for comparable access alternatives, rather than strict customer QOS, for the IXC equal access performance criteria: it was reasonable and practical to ensure engineering consistency than absolute performance equality. Moreover, it should also be apparent that this historical view of IXC-access is relevant to the performance parity objectives for CLEC-access in Ameritech's network. In this current situation, the goal is to ensure that access parity is achieved between Ameritech and each CLEC, rather than the prior case of ensuring access parity among all IXC's or customers (traversing an ILEC network).

For these reasons, our recommended approach to defining and assuring access performance-parity for CLECs and Ameritech will utilize the notions of *comparable network-QOS parity*, rather than strict customer-QOS parity. Specific challenges include: (1) selecting an appropriate definition of *network-QOS* and (2) defining *comparable network access arrangements* so that associated QOS can be contrasted in a meaningful way.

3. TRUNK BLOCKAGE VERSUS CALL COMPLETION

In this section, we assume that it has been resolved to look at *network-QOS* measures of access performance for *comparable network arrangements* and that the issue is what definition to use: trunk blockage or call completions (or other).

First, we need to be sure that the terminology is clear. **Trunk blockage** is generally derived by *averaging* ratios of overflows/attempts across time-consistent hours for up to 20 business days (a business month). This "unweighted average" is a calculation done for each hour (up to 24 such averages) for each "final" trunk group. No information about subtending high-usage groups is included since calls "not completed" on high-usage groups are simply offered to another group and, ultimately, a final group for completion. We do not suggest any changes in this definition. It is widely accepted, well-analyzed and implemented in all ILEC trunk network operations tools, including Ameritech's.

The "**call completion ratio**" advocated by Ameritech is a new metric, with very intuitive appeal and understanding, but with little or no history, analysis or implementation in tools. Qualitatively, it is intended to be similar to blocking, except that calls that were "blocked" (not carried) by the hierarchically-defined final trunk group, but were completed on a different route via network management, have been excluded from the "overflow" count in the above calculation. (Any successfully rerouted calls will appear as carried calls on this new alternate route.) In addition, blockages that occur due to actions or failures on the part of a CLEC may be excluded. While the trunk group blockage is always averaged over 20 days for each hour and group, the specific statistic (e.g., how many hours or days should be included or averaged) for call completion has not yet been standardized. Additional analyses will be required first.

With these two definitions (the second being quite preliminary at this point), we note that both have appeal and, at least for a while, both may play a role. The trunk group blocking is not only well-understood and accepted, but there are standardized tables of "action thresholds" (as in the Committee T1 Report No. 11 (June 1991) and the Bellcore SR STS-000317 (September 1990) that define when deviations from average blocking objectives are significant enough to warrant action and/or joint investigation by the involved parties. There should be no problem in adapting these blocking thresholds for use in joint planning and engineering of CLEC access.

However, as stated above, the call completion ratios also have great appeal for use in measuring network performance. They make clear Ameritech's intentions to complete all CLEC and Ameritech calls that have available alternate routes, even those outside the hierarchical chain. Nonetheless, we do have a few concerns. Our main reservation concerns the fact that, due to CLEC decisions concerning its interconnection network, CLEC calls may not have as many re-routing options as Ameritech. This could create or exacerbate an *apparent* inequity, as the percentage of reroutes for a CLEC will often be less than Ameritech's. (This problem does not occur with Trunk Blocking as long as "comparable" groups are measured.) There are two other concerns that must be *acknowledged and managed* when using the Call Completion Ratio as the measure of network QOS:

- It is not the engineering objective. In fact, no specific call completion objective is specified or intended (beyond the engineering blocking objective). This means that inconsistencies in blocking and call completion measurements and in engineering decisions could arise. For example, it is possible that average blocking measures are acceptable, but that call completion ratios do not imply performance "parity" (and vice versa). Moreover, traditional engineering methods and tools may have to be modified to make sure that rerouting alternatives exist and that network management utilizes them.
- Rerouting often contaminates and confuses the traditional trunk-based measurements. Trunk group loads may be under- or overestimated, capacity may be added in the wrong place or at the wrong time and performance statistics may be misleading.

4. RECOMMENDATIONS

- (1) Given the appeal of the "call completion" statistic as a performance measure, we recommend it as the preferred approach for assessing both trunk network performance and CLEC/ILEC parity. However, we believe that *future work should involve the development of an appropriate adjustment that reflects the relative magnitudes of corresponding rerouting options of Ameritech and the CLEC*. At a minimum, the statistics should be classified by InterLATA and IntraLATA-access, since they differ significantly in rerouting alternatives.
- (2) We believe that the *native form* of the call completion statistic should be similar to that for the trunk blockages. Specifically, for each trunk group, call completion statistics should be collected and averaged across *all* time consistent hours for up to **20 business days**. (We recommend postponing any processing of weekend data.) This will allow the ILEC to assess the effectiveness of its engineering and network management processes in improving network performance. We re-emphasize the fact that no specific call completion objective (beyond the engineering blocking objective) is stated or intended.
- (3) We do not recommend the use of call completion data in trunk group exception reporting. The existing "trunk blockage" reports (e.g., in the T1 Report and Bellcore SR, referenced above) continue to serve the intended purposes of identifying and resolving engineering and planning issues for access groups.
- (4) However, additional data analyses are required before **a specific and detailed** recommendation can be made as to how to aggregate the call completion statistics for use in a test of ILEC/CLEC performance **parity**. Clearly, the traditional notions of "busy hours" may not apply directly to all respective networks, population groups (Ameritech Retail, CLEC IntraLATA access, CLEC InterLATA access, and so on) and services. A more robust, practical and meaningful statistic will be developed for use in such tests.

METHODS APPLICATION FOR PARITY DETERMINATION

1. ROLE OF METHODS APPLICATION

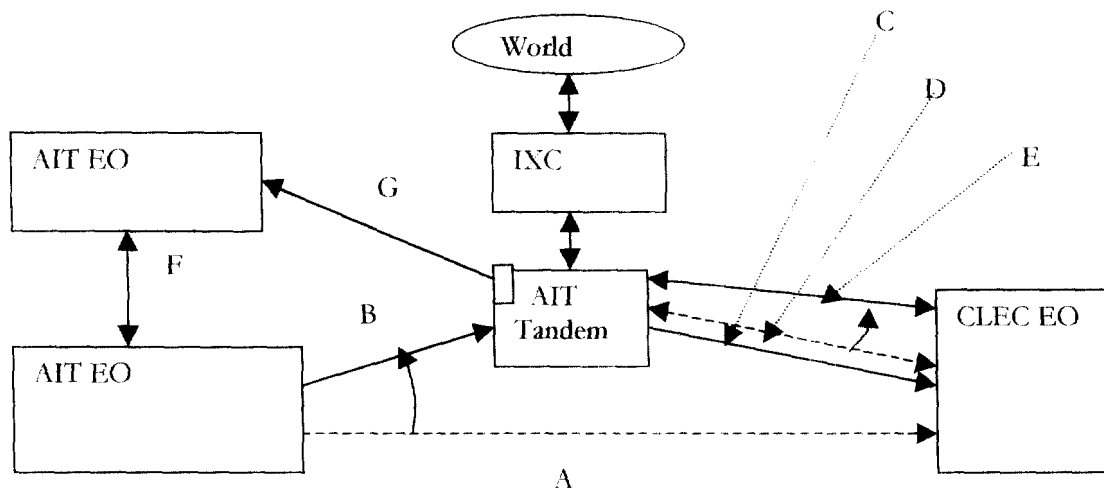
In traditional ILEC trunk engineering, call blocking is the performance metric that is used in both engineering the network and, at various levels, in assessing realized performance. In the context of InterLATA access, a set of rules, collectively referred to as the "Methods Application" (see Bellcore report SR-TAP-000191, Issue 2, December 1989, "Trunk Traffic Engineering Concepts and Applications") have been defined for applying and calculating a blocking exception metric for common trunk groups.

The previous section recommends "call completion" as a new metric for assessing trunk performance (albeit one without a specific objective) and, ultimately, parity determination. We emphasize that the selection of call completion as a metric does not by itself resolve the issue of parity determination. Additional work is required to develop a specific statistic for use in this application. Methods Application for parity determination must deal with a number of issues relating to the comparison of "unlike" trunk groups in the respective ILEC/CLEC populations. For example, if CLEC trunk groups carry different mixes of first offered and overflow traffic than ILEC trunk groups, should this be taken into account in determining call completion parity for CLEC versus ILEC trunk groups? If so, it would be necessary to account for different values of peakedness in CLEC and ILEC traffic, and apply different call completion factors in each case. Similarly, the Methods Application for parity determination should perhaps address the issue of forecast errors. Should the ILEC be held to certain parity tests even if the CLEC's growth forecasts are wildly inaccurate. If not, how does one discriminate between acceptable and unacceptable levels of forecast error? One of the most basic issues of this type is to define comparable CLEC and ILEC trunk groups for purposes of direct comparison.

2. COMPARABLE NETWORK ACCESS ARRANGEMENTS

As described above, the CLEC-access arrangement is quite different from the IXC-access arrangement in that CLECs operate within a traditional ILEC territory, such as Ameritech's, providing alternative access to local customers who may complete calls within a LATA or to another LATA via an INC. The IXC "equal access" (in a performance sense for Feature Group D) focused almost exclusively on the common final, which was shared by all IXCs and even the ILEC; however, CLEC-access has both common finals and various direct-trunking (final) arrangements connecting Ameritech to the CLEC. So, the relevant question is, if you agree on what statistics are meaningful to collect (blocking, call completions and so on), which network access arrangements are *meaningful* for comparison.

Ideally, since customer QOS cannot easily be computed, network QOS comparisons would be made between trunk groups (or collections of groups) with similar traffic and routing positions in the network hierarchy. This would ensure that groups that receive significant amounts of overflow would be compared to like groups. These alternate final groups are hard to engineer, having a mixture of overflow and first-routed demands. Groups with mixtures of IXC, CLEC and ILEC traffic would be compared to those with other mixtures of service types. And so on. In addition, as per the discussion in NPRM 98-72, ***both common trunk groups and interconnecting arrangements should be included.*** The following diagram describes the Ameritech (AIT), CLEC and IXC-access networks:



Group A is a PHU for AIT traffic to the CLEC. Common Trunk Group B carries a variety of traffic types (IXC, CLEC and Ameritech), has both first-offered and overflow demands and is directional from Ameritech to the world. Trunk Group C carries only CLEC demands (from Ameritech), includes first-routed and overflow (e.g., from Trunk Group A) demands, and is directional to the CLEC. Trunk Groups D&E combine to carry CLEC's IXC demands (the current working arrangement is that D is managed by the CLEC and E by AIT); traffic offered to D is first-routed, and can overflow to E. Group D measures peg counts (PCs), while E measures any overflows (O). Both record usage (U). Trunk Group F carries only first-routed AIT traffic. Trunk Group G carries only Ameritech traffic (the portion of the indicated AIT tandem here is a "local tandem"), which may be first-routed or overflow. In the language of the NPRM, section 97, trunk group B would be **"common"** and trunk groups A, B, C, D, and E would be **"interconnecting."** (Note that the indicated directional groups: A, B, C would have directional counterparts going the other way. Those originating at the CLEC EO would not be measured or managed by Ameritech.)

With regard to the above network architecture, it is recommended that reasonable comparisons would be:

- (1) Type B (common and interconnecting) to combined Type D/E (interconnecting)
- (2) When there are sufficient deployments of "local tandems", compare Type C (only CLEC) to Type G (only Ameritech). In the interim, it may be necessary to compare Type C (only CLEC) to Type F (only Ameritech).

3. OTHER METHODS APPLICATION ISSUES

A number of other issues regarding Methods Application for parity determination are summarized in the following table:

Complicating Factor	Problem	Impact
Measurement Variability	A critical component of the engineering process is an estimate of current loads and associated trunk requirements, as well as blocking statistics.	Estimates of the mean value for a key statistics (e.g., loads, blocking and call completions) depend on the group size, specific data obtained in the selected hour and days, sampling rate, peakedness and day-to-day variation. Therefore, any performance measure, such as blocking or call completion ratio, can only be estimated to within "some statistical interval" and, hence, decision thresholds must be defined.
Forecast and Growth Variability/ Uncertainty	Network engineering, call routing and capacity planning depend on forecasts of demands.	Poor forecasts from the CLEC can lead to inadequate or excessive capacity (see T1 Report No.11 for some background), insufficient lead time for augments and excessive dependence on network management for completing calls. Such problems can be costly to anticipate (adding uncompensated reserve capacity) or overcome (expensive augments) and should be considerations in decisions of performance parity.
Business Considerations	Network modernization, major equipment and technology upgrades, new services, stimulating calling are all significant factors that must be communicated among the ILECs and CLECs when the common and interconnecting networks are affected.	While these factors can be difficult and disruptive, good coordination and communications between the affected companies can minimize such impacts. Where such communications do not take place because of decisions by the CLEC, the impact should be considered in decisions of performance parity.

4. EXCLUSION OF NEW CARRIERS FOR A "WARM-UP" PERIOD

Finally, we believe it is advisable to exclude new CLECs from the parity determination process (though not from data collection) for a warm-up period of up to six months. Their networks are likely to be initially small, but growing somewhat erratically as they install new capacity, initiate ad campaigns and stimulate growth through various promotions. This six month period would allow the new CLEC to establish a "track record", and give both the CLEC and ILEC an opportunity to develop effective mechanisms for data exchange, communications and problem resolution before the parity determination process is begun.

USE OF THRESHOLDS TO IDENTIFY POTENTIAL PROBLEMS

Our experience in previous industry and regulatory forums has indicated that the most convincing and sustainable positions are those that are backed with both (mathematical) models and data. *Ad Hoc* methods may sound logical and appealing, but may also be readily contradicted or contested by another party that has models and data. In fact, some of the Commission's hesitance in Docket 97-278 may have stemmed from the lack of formal model to support Ameritech claims. Therefore, our suggested approach to parity determination will be based on a formal methodology, with both mathematical and statistical foundations. Moreover, it will have some similarities to the models that are the basis for the "Trunk Blocking Action Thresholds" that have been approved and implemented by many organizations, including the FCC (see Access Tariff Section 6.5.7), all RBOCs in their access tariffs, most IXC's, Bellcore (see SR STS-000317), the T1 standards body (T1 Report No.11) and the ICCI's Availability Workshops (1987 to 1991).

Our recommendation is that initial identification of potential parity problems (i.e., potential significant differences between CLEC and ILEC performance) be made by means of a threshold on an aggregate call completion metric. Specifically:

- Ameritech should compute for each reporting population (e.g, Ameritech InterLATA, CLEC InterLATA, Ameritech IntraLATA, CLEC IntraLATA, etc.) the **mean and variance** of the Call Completion Ratio, CR, for the 20 business days (month). The statistics associated with this averaging process reflect the dynamics of the changes, due to any of the possible causes enumerated above, that may be impacting the performance of the population. These factors include those enumerated in the table, above, such as: demand peakedness and day-to-day variation; the CLEC interconnection-network architecture and sudden unforecast changes in traffic levels.
- Ameritech should apply a parity test of the following form:
 - Compute the difference, $\delta = CR_{\text{AMER}} - CR_{\text{CLEC}}$ between the Completion Ratios for the two comparable populations.
 - If $CR_{\text{CLEC}} \geq C_{\text{min}}\%$, then parity is declared since, by definition, C_{min} is the best that can reasonably be expected by either the CLEC or the ILEC. However, if $CR_{\text{CLEC}} <$

$C_{min} \%$ and $\delta \leq T$, then parity is also declared since differences may be due to either statistical fluctuations or a common performance-affecting phenomenon.

- If $CR_{CLEC} < C_{min} \%$ and $\delta > T$, then the test fails and parity **may not** have been achieved. Ameritech will investigate, both by itself and jointly with the CLEC, when necessary, the causes and take "appropriate corrective action."^{1,2,3} The solution may or may not involve adding extra capacity (i.e., to a group carrying CLEC traffic). In some cases, problems can be cleared by making changes within the CLEC network, correcting erroneous data or updating network routings or translations.
- In this scheme, consistent with our qualitative definition of parity, the threshold T is designed to "normalize the data" to reflect various sources of uncertainty and variability and to directly measure whether call completion differences are both **significant and persistent**. It cannot by itself determine whether a problem is under the **control** of the ILEC or the CLEC; it is therefore reasonable to exclude from CR_{CLEC} any measurements related to performance problems outside the ILEC control. In summary, T depends on several factors, but most specifically on (1) measurement (including sampling), growth and forecast data variability that have affected trunk engineered capacity during the 20-day period and (2) on some key business parameters, such as how much "reserve capacity" is appropriate. (The definition of these thresholds, validation with Ameritech data and full explanations are still under analysis.) Note that this threshold, T , reflects **more** considerations than the industry's standard blocking thresholds.⁴ The reason is that the network performance parity objective is comparing two **different** aggregate populations

¹ For example, **Ameritech's position** in the ICCF Availability Workshop (December 10, 1987) regarding excessive blocking on the common final included the following: "when common trunk groups exceed the servicing threshold an investigation should begin to determine the cause... if cause remains unknown, the group remains under investigation. If additional trunks are required, sufficient capacity shall be provided to return the group to its engineered objective. When the blockage is caused by other sources, different actions may be necessary. For example, IXCs may need to service or create high-usage groups. Joint planning between the IXCs and LECs should provide sufficient and timely trunk additions when special events are planned by either group. LECs cannot be responsible for high common trunk group blocking when it is caused by special events without sufficient notification.... The engineered trunk group capacity is based on a forecast developed from many sources. If any, or many, of these sources are inaccurate, the trunk group could block..."

² Other RBOCs had similar positions. Bell Atlantic used the term "Immediate Action Limit" when it referred to the Threshold. This emphasized their intention to immediately investigate and take appropriate action. A few RBOCs and IXCs proposed targets on the percentage of groups that would exceed the threshold for 1 or more 20-day periods

³ See Committee T1 Technical Report, No 11, for more details on the IXC (pages 28-29) and LEC (pages 28-32) positions.

⁴ By consensus, the blocking thresholds, as referenced in the T1 Report and Bellcore SR and other documents, were designed to account only for the **effects of measurement errors (variability)**. That is, the thresholds reflected reasonable variations in measurements for a properly engineered final trunk group and, therefore, the extreme tail values could be expected to reveal true service violations. (For a common or connecting final trunk group, the objective was an **average** blocking of .5%, with a threshold of about 2% for "immediate action") "Detected" service problems, arising due to maintenance, outages, failures, unusual events (disasters, mother's day or stimulated calls), forecast errors or network modernization, would to be resolved quickly, by joint agreement of the affected companies

(which may have differing growth patterns, forecasting data, etc.), rather than analyzing the engineering performance of one (common or connecting) trunk group.

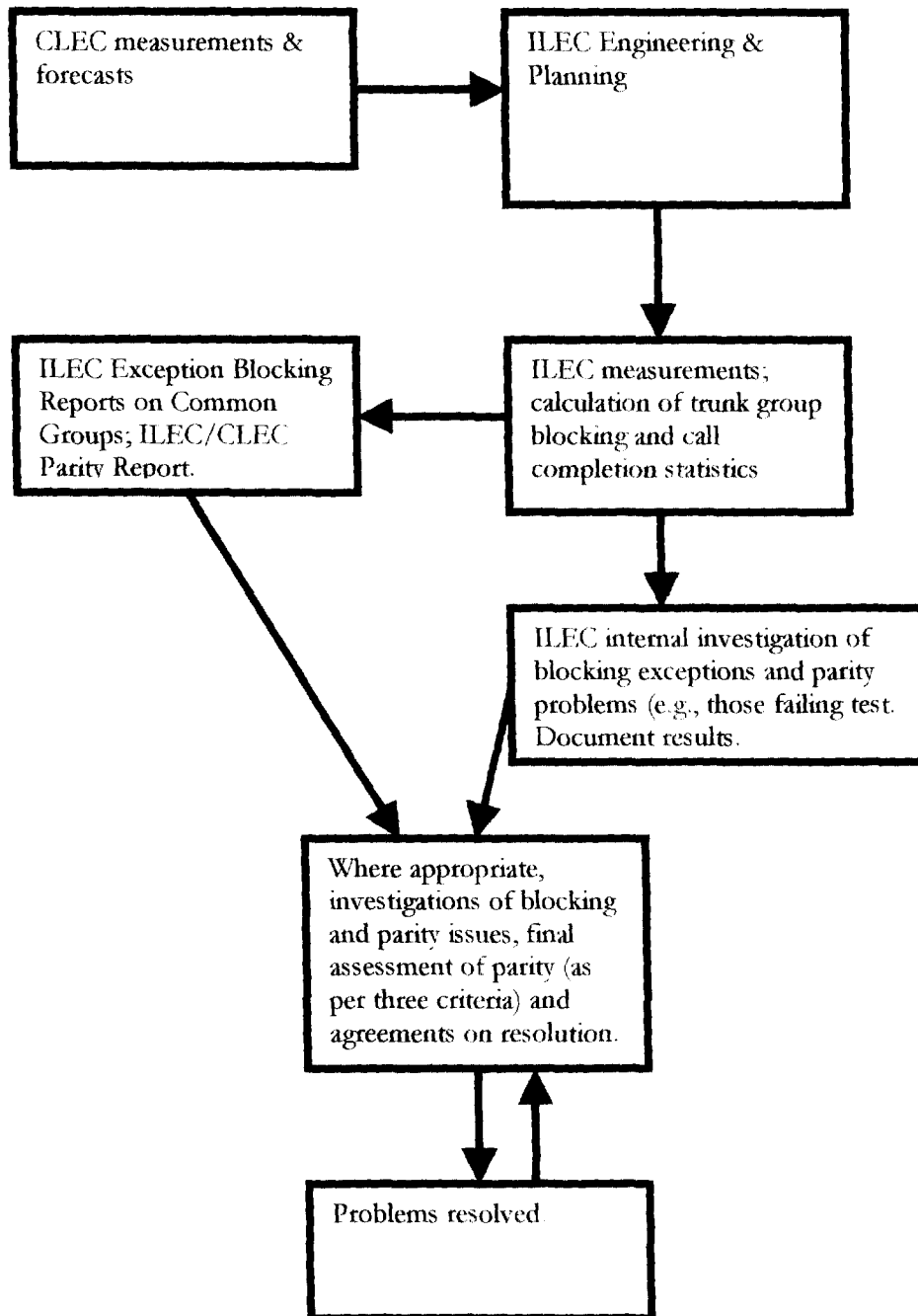
- Consistent with the FCC request, it would be appropriate to provide the FCC and CLEC with information, regarding each reporting category, on:
 - The magnitude of the parity difference, δ , the associated threshold, T , and the test result.
 - The capacity of the reporting population (in units of call attempts, for example).
 - Where appropriate, how many consecutive months $\delta > T$. We do NOT recommend that any specific numerical objectives be set here. (See comments on repeated trunk blocking, below.) Rather, it is better that a pattern of aggressive anticipation and resolution of parity problems be established (see below).
 - We also recommend that Ameritech document any actions, especially any resulting from joint negotiations with the CLEC, that are being taken to restore (or anticipate the need to restore) parity, but especially where $CR_{CLEC} < C_{min}\%$ and $\delta > T$. This documentation of results and plans is very consistent with the approach taken in the reporting to the FCC of trunk blockages and significant network outages/failures.

PARITY DETERMINATION PROCESS

In the foregoing material we have suggested that:

1. A failure to achieve ILEC/CLEC parity must be based on three critical factors:
 - Significant difference in parity
 - A persistent difference in parity
 - A problem under the control of the ILEC
2. The parity metric, and associated statistical test, will be based on call completion ratios.
3. Potential parity failures should be identified by means of a threshold criterion, where the threshold T allows for relevant factors, such as measurement and forecast variability.
4. Exceeding the parity threshold, by itself, should not necessarily be taken as a parity failure. Instead, once potential parity failures are identified by means of the threshold mechanism, they should be jointly investigated, when necessary, to determine whether parity did or did not occur. A true parity **problem** must meet all three criteria above.

The specific parity resolution process should include the following steps:



That is, determination of parity should not be a purely mathematical process, since this could lead to inflexibility and incorrect diagnosis of network problems. Instead, further

investigation should be carried out, both internally by the ILEC and jointly, when necessary, to determine why the problem occurred and how, by whom and when it can best be fixed.